

# Science Enabled By the High Altitude Airship (HAA)



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**And**

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# **A Low “Geosynchronous” Autonomous Platform for Science**

- **What science can be done from 18km or higher?**
  - Uniquely
    - High Spatial Resolution (meters or less)
    - High Data Rates (i.e., high time resolution)
    - Hover over interesting sites (fire) or follow phenomena (storm)
  - Nearly as well as from space but also.....
    - More cheaply and for longer than sounding rockets, airplanes, or UAVs
    - More timely and larger payloads than satellites
    - Longer duration than current scientific balloons and has propulsion system so can station keep, if desired.

**HAA offers more frequent and cheaper access to space  
and can obtain unique data sets**

# **Astrophysical Observations**

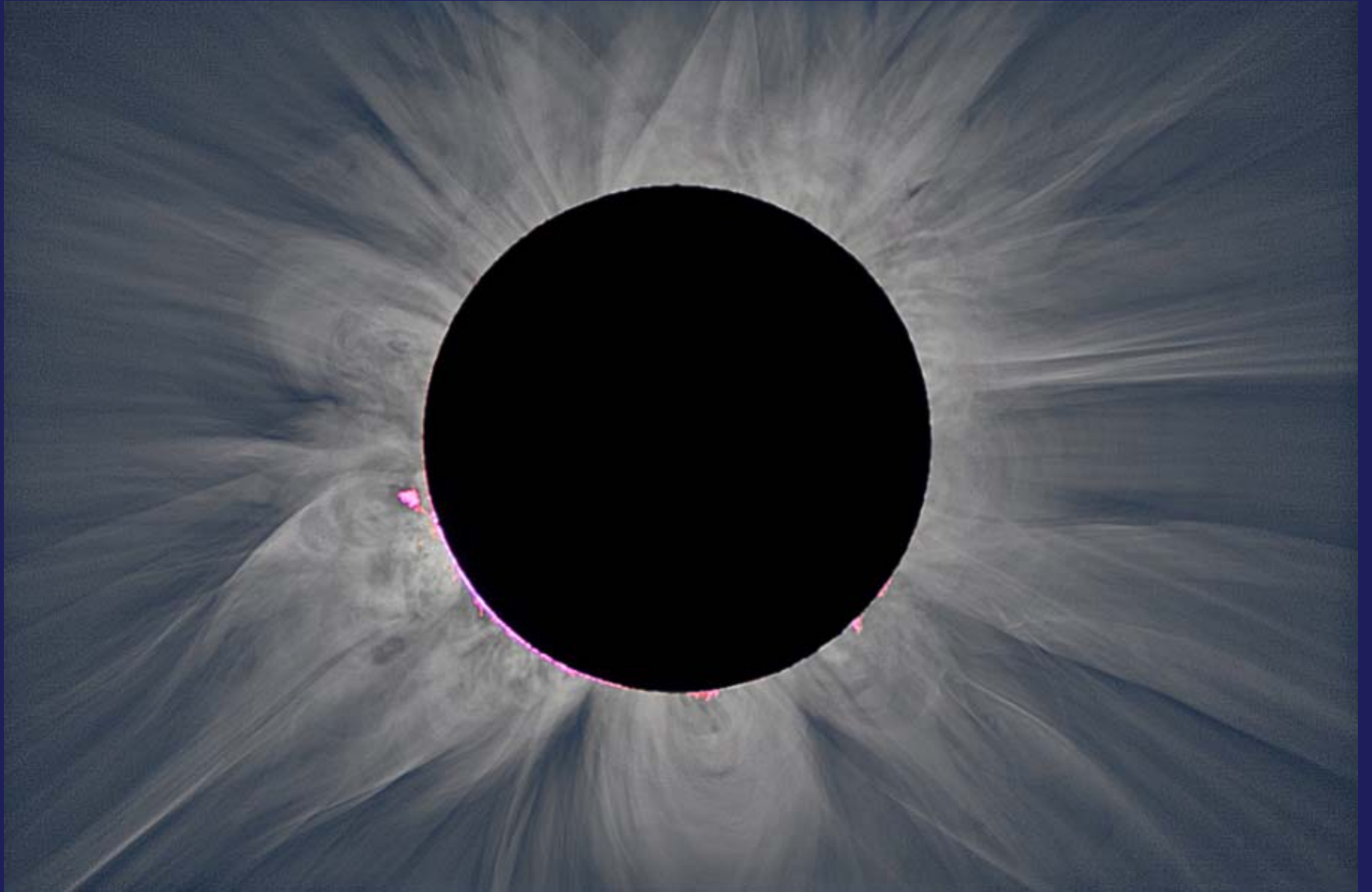
- **Optical & IR Telescope: long duration observations**
- **HE supernova observations (fast response)**
- **Comet & Asteroid Encounters**
- **.....**

# Earth Science Applications

- **Tropospheric Wind Measurement**
- **Monitoring Pollution Plumes**
- **Detailed Coastal Water Characterization (e.g., Chesapeake Bay)**
- **Ice Sheet Characterization**
- **Tracking Storm Development (e.g., Hurricanes)**
  - Column temperature and moisture content (IR sounder)
- **Ground-truth absolute calibration of satellite data**
- .....

# Heliophysics Application

- Ultra-high resolution ( $<0.1$  arcsec) optical imaging of the photosphere and chromosphere (above most of the atmosphere)
- Solar Coronagraph to look at high-resolution streamers, CME's, solar wind acceleration, etc.
- Absolute TSI measurement and on-orbit calibration source
- Auroral Imaging
- ....



# **System Requirements**

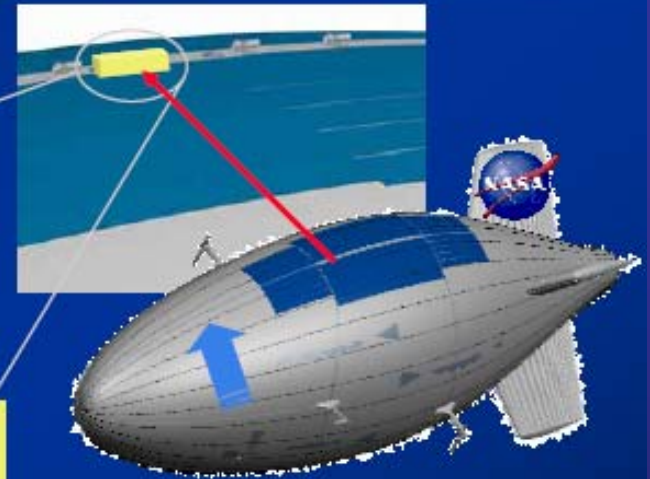
- **60 K ft altitude**
- **Stable fine pointing (sub-arcsec)**
- **Long-duration**
- **500 lb instrument capability**
- **1 kW power**
- **Station-keeping or maneuverability**
- **Top and bottom mounted instrument**

# HAA Capabilities/Characteristics

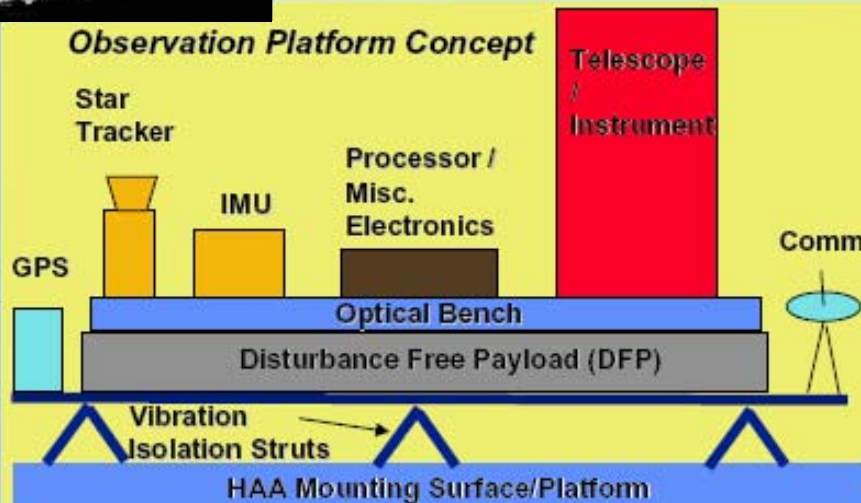
|                      | Prototype                              | Operational                      |
|----------------------|--|----------------------------------|
| Mission Length       | 30 days                                | 0.5 – 1 year                     |
| Payload Mass         | 250 kg                                 | 3000 kg                          |
| Payload Power        | 3 kW                                   | 10 – 70 kW                       |
| Mission Phasing      | May – September<br>(Equator: All Year) | All Year                         |
| Operational Altitude | ~18 km                                 | >20 km                           |
| Operational Mode     | Semi Autonomous                        | Semi Autonomous                  |
| Operational Area     | CONUS / Equatorial                     | Worldwide (Lat. $\pm 45^\circ$ ) |
| Size                 | ~450 ft by 140 ft                      | ~785 ft by 140 ft                |
| Volume (He)          | 3.7m ft <sup>3</sup>                   | 5.7m ft <sup>3</sup>             |



# Designed to Accommodate Instruments with High-Accuracy Pointing



## Observation Platform Concept



**Disturbance Free Payload (DFP)**  
**Vibration & Precision Pointing Technology**  
**> 60dB broadband vibration isolation**

# **HAA Advantages**

- **Potential for instrument testbed, absolute calibration,**
- **PI development and EPO**
- **Recoverable and refurbishable**
- **Has simultaneous multi-discipline mission capability**
- **Enables long-duration missions**
- **Provides a stable geostationary platform with tracking capability**

# Discussion

- **Need to initiate a study to address the following issues :**
  - Unique science opportunities
  - Power system scalability / requirements
  - Increased Payload capability
  - Operations at Wallops, Glenn, and/or Ames
  - Cost sharing with other Government Agencies